

Specifications for a Stand-Alone Automated Cold Vapor Atomic Fluorescence Mercury Spectrometer (CVAFS)

1. Compliance with EPA Regulatory Methods

The instrument must be fully compliant with all hardware and QC requirements of EPA Method 245.7

2. Instrumentation and Analytical Performance

- a) The instrument must be based on cold vapor atomic fluorescence (cold vapor atomic absorption will not be considered).
 - I. When operating under the conditions necessary for method 245.7 the instrument must provide an Hg detection limit better than 0.2 ppt.
 - II. The linear range must be 5 orders of magnitude from the detection limit.
- b) The system must automate the addition of reducing agent to the sample prior to gas-liquid separation.
- c) The system must be equipped with a gas/liquid separator that meets the following specifications:
 - I. The gas-liquid-separator must be designed to prevent analytical and/or contamination problems when foaming samples are encountered.
 - II. The gas-liquid-separator must be designed to maximize the analytical recoveries of complex or poorly digested samples.
 - III. The gas-liquid-separator must be highly tolerant to particulate material in the samples (i.e. there should be no restrictions less than 1-2 mm in the gas liquid separator).
- d) For enhanced performance when using method 245.7, the sample vapor must pass through a fluoropolymer dryer prior to reaching the fluorescence cell.
- e) Sample, reductant, acid, etc., liquid flows must not enter any part of the instrument chassis so that inadvertent leaks cannot damage the instrument.
- f) Mercury excitation lamp intensity must be continuously referenced to provide stability and low detection limits.
- g) The instrument must be fully automated including computer control of all lamp, gas, liquid, dryer, and autosampler controls.
 - I. The system must be equipped with a computer controlled variable speed peristaltic pump to maximize dynamic measurement range and optimize the sample consumption.
 - The peristaltic pump must have a minimum of five channels to handle sample, reductant, flow-through rinse, and phase separator drainage

- II. To maximize the dynamic measurement range, the system must be equipped with computer controlled gas flow controller such that any flow between 0 and 1 L/min can be selected.
- III. The system must be equipped with an autosampler that will hold a minimum of:
 - Seven 50 ml standards,
 - Seven 50 ml check standards,
 - Eighty-eight 15 ml samples.
- IV. The autosampler must have a flow-through rinse station to prevent sample carryover.

3. System Controller:

- a) The system must be a computer with 2.66 GHz (minimum) Intel Core 2 Duo or AMD Athlon II X2 processor operating under Windows XP Professional SP3. The system must include a color, inkjet page printer.
- b) The controller must have 48x32 CRRW/DVD; USB or optical Mouse, and 17 (minimally) inch flat-panel monitor, 10/100/1000 Ethernet on board.
- c) The controller must have a minimum of a 80 Gb hard disk

4. Software:

- a) Instrument operating software must be Windows™ based to provide compatibility with external packages such as Excel, Access, and Word.
- b) The instrument operating software must meet all QC criteria of EPA method 245.7.
- c) The system must keep track of usage and report when scheduled maintenance is required.
- d) The system must provide context-sensitive help so that the operator can find desired information quickly.
- e) Software must provide a standby condition for the peristaltic pump whereby the pump is cycled periodically to extend tubing lifetimes.
- f) Software must be able to use calibration standard locations for quality control checks when desired.
- g) Software must provide a graphical display of each signal reading as a function of time.
- h) Uptake, integration, and rinse times must be independently programmable.
- i) Must provide automated method of standard additions analyses.
- j) Software must provide a control chart whereby quality control checks, samples, or standards may be graphed over time automatically.
- k) The software should provide cup controls whereby special functions such as recoveries and duplicates may be added at operator-defined locations.

5. High Concentration Protection:

The system must have an automated mechanism for prescreening each sample to protect against contamination from samples with unexpectedly high mercury content.

6. Upgrade Capability:

The system must have the ability to be field upgradeable to be fully compliant with EPA method 1631.

7. Installation & Training

Must include on-site installation and a minimum of 7 hours of training by a factory-trained service engineer in our laboratory, once the installation is complete.

8. Warranty

A 12 month parts, labor, and travel warranty must be provided. Any and all service required during the warranty period must be performed on-site at our laboratory.

9. Service

Free telephone support as well as depot service (return to factory) or full field service by factory trained field service engineers must be available should the instrument require service. Also, extended maintenance plans must be available.